MUSCLE TYPOLOGIES AND TALENT TRANSFER IN ELITE CYCLING

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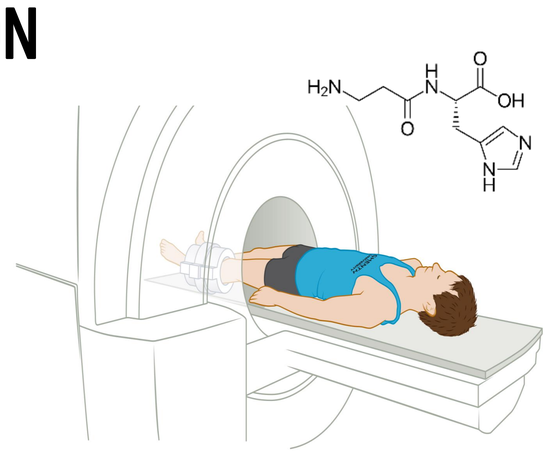
INTRODUCTION

Classical muscle biopsy studies[1] demonstrated that elite **endurance** athletes exhibit a more pronounced **slow** muscle typology, while elite athletes who excel in **explosive** disciplines, have a predominant **fast** muscle typology. **Muscle carnosine quantification** by proton magnetic resonance spectroscopy (^{1}H-MRS) was developed as a **non-invasive alternative to estimate muscle typology**[2]. The validity of this technique was initially demonstrated in track-and-field, where muscle carnosine levels in elite athletes gradually decrease with increasing running distance. Also in **cycling**, it is anticipated that the various disciplines span a range of muscle typologies, but **solid data are scarce**.



Proton Magnetic Resonance Spectroscopy (^{1}H-MRS)
'Muscle Talent Scan'

AIMS

1. To compare the **muscle carnosine levels** of elite cyclists, excelling in **different cycling disciplines**.
2. To investigate **transfer possibilities** between cycling disciplines, **based on muscle typology**.

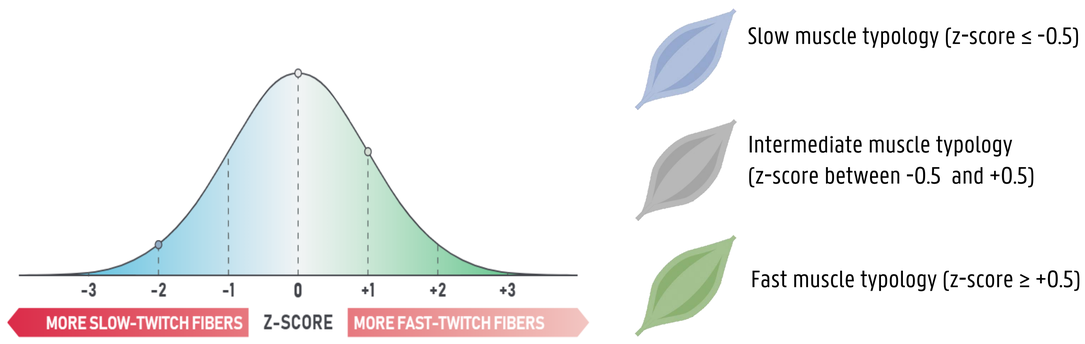
METHODS

Muscle carnosine levels of 85 elite cyclists excelling in 8 different cycling disciplines were measured with the Muscle Talent Scan (^{1}H-MRS) in the 2 calf muscles: m. soleus and m. gastrocnemius.

Elite cyclist: European/World Championship participant; UCI WorldTour Team; Pro Continental Cycling Team

- 5 multi stage riders
- 14 single stage riders
- 5 road sprinters
- 4 BMX riders
- 29 track endurance cyclists
- 9 track-sprinters
- 11 mountain bikers
- 9 cyclo-crossers

To investigate the muscle typology of the cyclists, their muscle carnosine levels were converted to z-scores, based on the normal carnosine distribution of a control population (112 women, 163 men).

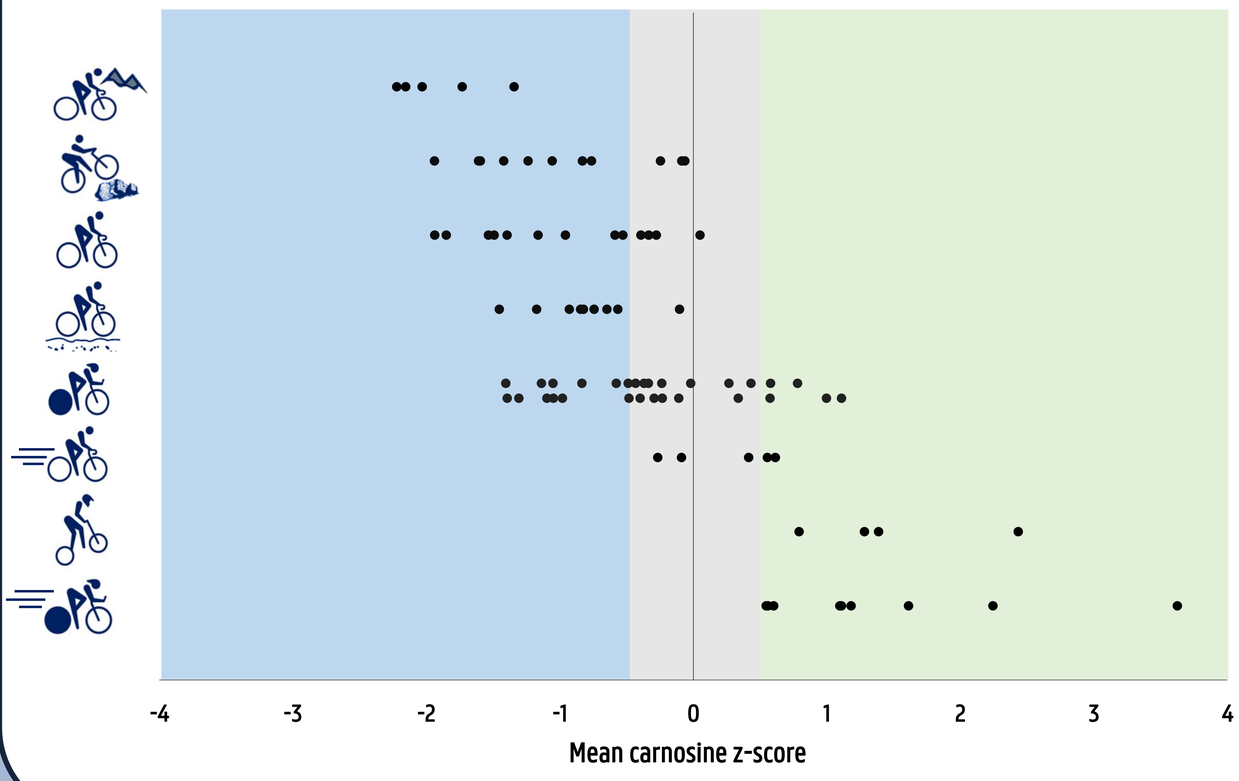


- Slow muscle typology (z-score ≤ -0.5)
- Intermediate muscle typology (z-score between -0.5 and +0.5)
- Fast muscle typology (z-score ≥ +0.5)

RESULTS

1 Carnosine levels

Muscle typology distribution for all cycling disciplines.



2 Talent transfer

Differences (p-values) in mean carnosine levels between the 8 cycling disciplines. The more the disciplines differ from each other, the less transfer seems possible, based on muscle typology.

	Road multi stage	Mountain bike	Road single stage	Cyclo-cross	Track endurance	Road sprint	BMX
Road multi stage							
Mountain bike	NS						
Road single stage	NS	NS					
Cyclo-cross	NS	NS	NS				
Track endurance	<0.001	NS	NS	NS			
Road sprint	<0.001	0.026	0.027	NS	NS		
BMX	<0.00000001	<0.000001	<0.000001	<0.00001	<0.001	NS	
Track-sprint	<0.0000000001	<0.000000001	<0.000000001	<0.0000001	<0.000001	NS	NS

NS = No significant difference

Example

- Road sprint ↔ Track endurance
- Track-sprint ↔ Road multi stage

CONCLUSIONS

1. Prominent differences in muscle carnosine levels exist between elite cyclists of various disciplines. Road cyclists, cyclo-crossers and mountain bikers display low carnosine levels, indicative for a slow muscle typology, whereas the carnosine levels of BMX riders and track-sprinters are indicative for a dominant fast muscle typology.
2. The non-invasive character of the Muscle Talent Scan opens opportunities for application in transfer and talent orientation in cycling.

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